MACROPRUDENTIAL POLICY FRAMEWORKS IN DEVELOPING ASIAN ECONOMIES

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ABSTRACT

Over the last decade, developing Asia's deeper global financial linkages have been accompanied by greater financial integration. As the region becomes more interconnected, a key priority is to ensure that the dynamic environment is supported by better coordinated and potentially consistent macroprudential policies to adequately control systemic risks. Within the context of global financial developments, this paper presents a general macroprudential policy framework that highlights important aspects to conducting policy. It also provides an overview of how some Asian economies, New Zealand, and the euro area implement their macroprudential policies. It reviews existing macroprudential policy frameworks of five high-growth developing economies—Cambodia, Mongolia, Myanmar, Sri Lanka, and Viet Nam—identifying improvements and continuing challenges for their financial systems, which will likely grow more complex. Identifying and addressing key issues will help improve their existing macroprudential policy frameworks.

Keywords: developing Asia, financial stability, macroprudential framework, systemic risk

JEL codes: G01, G28, L51

I. INTRODUCTION

Financial crises have been relatively frequent over the last half century, despite continual efforts—especially since the 1997/98 Asian financial crisis—to promote financial stability and enhance prudential supervision (Zamorski and Lee 2015a). The 2008/09 global financial crisis (GFC) showed the inadequacy of purely prudential surveillance systems; and the need for bank supervisors to better detect the buildup of systemic macroeconomic risks before they threaten the financial system (Lee, Asuncion, and Kim 2016). To help prevent future crises, financial authorities require a large set of financial reforms, which include both international and domestic macroprudential policies (Claessens and Kodres 2015).

Morgan (2013) emphasized the need for a macroprudential approach that helps identify looming systemwide risks. He noted that the microprudential approach in financial regulation is inadequate—because they focused more on individual institutions, supervisors worldwide failed to recognize the interconnections across financial firms, sectors, and markets. Acting appropriately on predetermined financial vulnerabilities using a macroprudential approach can reduce the probability and severity of future financial crises (Hannoun 2010).

Macroprudential policy primarily aims to identify, contain, and prevent the buildup of systemic risk. In contrast with the traditional microprudential approach, macroprudential policies cover the financial system as a whole, including interactions between the financial and real sectors, as well as the possible spillover effects on other economies. Several macroprudential tools exist for authorities to calibrate to address identified systemic risk. Lim et al. (2011) classified frequently used macroprudential instruments related to three broad categories: (i) credit, (ii) liquidity, and (iii) capital. Recently, Lee, Asuncion, and Kim (2016) presented an empirical framework for analyzing how effectively macroprudential policies control credit growth, leverage growth, and housing price appreciation. Their results showed that macroprudential policies promote financial stability in Asia—and more specifically, which types of macroprudential policies have proved effective for various macroeconomic risks. Macroprudential authorities, however, need to ensure instruments are used appropriately given the complementarities and possible conflicts with, for example, monetary and fiscal policies that aim for the same end goal. Central banks, governments, and policy coordinating bodies all play important roles in macroprudential policy making.

The GFC also underscored the need to establish a stronger macroprudential policy framework—one more responsive to an increasingly dynamic global financial environment. Systemic risks pre-GFC were fueled, among other factors, by a lack of understanding of the risks accompanying innovative financial products. Over the last decade, developing Asia has seen greater financial integration as its financial interlinkages have widened. As the region becomes more interconnected, a key priority is to ensure that this is supported by regulatory and supervisory regimes that adequately control related risks to financial stability (Zamorski and Lee 2015a). More integrated economies require better coordinated and potentially consistent macroprudential policies to avoid negative spillovers that could counteract the objective of promoting financial stability (Constâncio 2015).

Within the context of global financial developments, how should macroprudential policy frameworks be structured and improved in developing Asian economies with high growth potential such as Cambodia, Mongolia, Myanmar, Sri Lanka, and Viet Nam? These will have direct implications on their financial systems—which would be expected to become more complex. Addressing key issues and improving existing macroprudential policy frameworks warrant careful attention. Not only do they aim to prevent the buildup of systemic risks that could result in financial crisis, but are ultimately

anchored on the end goal of ensuring the financial stability required to support sustainable, inclusive economic growth and development.

Section II of this paper presents a general macroprudential policy framework highlighting various key aspects. Section III highlights the experiences of selected Asian economies, New Zealand and the euro area in implementing macroprudential measures. Section IV reviews existing macroprudential policy frameworks in Cambodia, Mongolia, Myanmar, Sri Lanka, and Viet Nam, identifying challenges and areas where improvements could be made, while section V concludes.

II. KEY ASPECTS IN A GENERAL MACROPRUDENTIAL POLICY FRAMEWORK

A stable financial system boosts investments and contributes to sustainable economic growth and development. But a global financial environment with greater cross-border financial linkages pose another challenge to developing economies with less developed financial systems—where capital markets are still developing and deepening, and banks typically play an important role in providing affordable credit to businesses and consumers. Effective bank regulation and supervision is therefore critical to ensure that sound, stable, and resilient banks are well positioned to meet the credit needs of their customers and allow depositors to accumulate savings, which also provides a stable funding source for loan portfolio growth (Zamorski and Lee 2015b).

To do this, economies in developing Asia need to strengthen their macroprudential frameworks. A new legal framework for macroprudential policy should be established across economies to equip macroprudential authorities with a set of concrete policy instruments. Likewise, they need to ensure their macroprudential policy framework is in tune with macroeconomic policies and microprudential supervision.

Saito (2014) cited four pillars of macroprudential policy that should be strengthened: (i) collecting information on risks to the financial system, (ii) analyzing and assessing that information, (iii) designing and making institutional arrangements to manage risks, and (iv) establishing institutions and implementing policy to address the risks and their consequences.[1]

A. Institutional Aspect

The effectiveness of macroprudential policy measures depends on an institutional structure with clearly defined roles and powers of relevant authorities. This can prevent conflicts or tensions while guaranteeing transparency and accountability. In most Asian economies, the financial stability role of specific agencies has a legislative mandate with explicit objectives and powers (Table 1). Clearly, central banks typically hold the primary role of advocating and maintaining financial stability.

The lead authority or agency for macroprudential policy making, its defined objectives and delineation of functions, powers, and responsibilities must all be clearly specified by law (Krishnamurti and Lee 2014). Macroprudential policy decisions are more binding and their accountability structure more clear under a macroprudential policy framework with strong legal foundations.

[1] Saito (2014) emphasized the need for close cooperation and coordination among relevant agencies.

Table 1: Agencies with Financial Stability Mandate in Selected Asian Economies

Economy	Mandated via	Responsible agency
People's Republic of China	Legislation	CB
Hong Kong, China	Legislation, Executive decision	CB, I, S, MOF
India	Executive decision	CB, FSC
Indonesia	Legislation	IR, FSC
Japan	Legislation	CB, DI, IR, MOF
Republic of Korea	Legislation	CB, IR, MOF
Malaysia	Legislation	CB
Philippines	Legislation	CB, FSC
Singapore	Legislation	CB
Thailand	Legislation	CB, FSC
Viet Nam	Legislation	CB

CB = Central Bank, DI = deposit insurance agency, FSC = financial stability committee or other policy coordination bodies, I = insurance regulator, MOF = Ministry of Finance, S = securities regulator, IR = integrated financial regulator.
Source: Lim, Cheng Hoon, Rishi Ramchand, Hong Wang, and Xiaoyong Wu. 2013. "Institutional Arrangements for Macroprudential Policy in Asia." IMF Working Paper No. 13/165.

It is critical that the designated macroprudential authority has adequate power to effectively undertake its mandate. Krishnamurti and Lee (2014) emphasized that the macroprudential authority should be equipped with (i) a clear mandate to promote financial stability, (ii) independence and adequate resources, and (iii) the power to define its oversight perimeter and to initiate or require policy responses when warranted.

IMF-FSB-BIS (2016) identified at least four prerequisite powers for the macroprudential authority to fulfill its mandate: (i) obtain information from other authorities and fill data gaps (information power), (ii) influence the activation and calibration of regulatory constraints (calibration power), (iii) influence the designation of individual institutions as systemically important (designation power), and (iv) initiate changes in the regulatory perimeter to capture financial institutions whose activities may increase financial stability risk.

Establishing a clear decision-making framework and flow is another important consideration in designing a macroprudential governance structure. The design should ensure that the macroprudential authority can perform its functions and responsibilities independent and unbiased from financial market and political interference.

Economies may choose from two general governance structures. The first—the central bank structure—mandates the central bank to lead macroprudential policy making (Figure 1). Osiński (2013) and Duncan and Nolan (2015) both agree that central banks should take the lead in macroprudential policy. Central banks possess the necessary skills and expertise in systemic risk identification; and its political independence will guarantee better and efficient use of macroprudential tools. This setup is common in economies where supervisory and regulatory functions or powers lie under central bank authority.

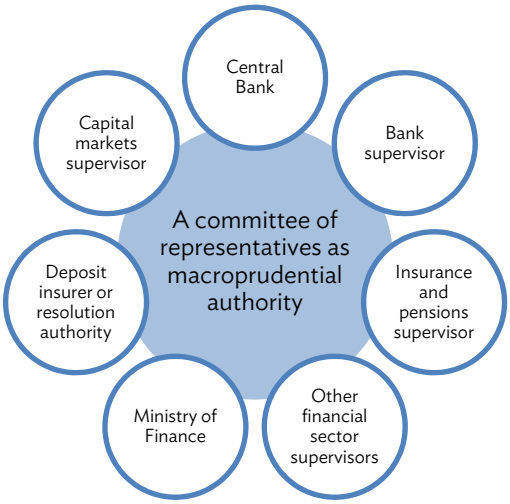
This structure is adopted in Malaysia, the Philippines, and Singapore, among others. Aside from bank supervision, macroprudential policy making is assigned to central banks through a dedicated committee. The central bank governor chairs the committee with deputy governors responsible for monetary policy, financial stability, and microprudential supervision as members.

Figure 1: The Central Bank Structure

Source: Krishnamurti, Damodaran, and Yejin Carol Lee. 2014. "Macroprudential Policy Framework: A Practice Guide." Washington, DC: World Bank.

The second structure uses a governance model where the central bank is not the microprudential supervisor, but nonetheless is in a better position to carry out the role of lead macroprudential agency (Figure 2). This model, however, requires closer coordination and cooperation between the central bank and the prudential supervisor (Krishnamurti and Lee 2014). An interagency body is typically established within the central bank, and allows the participation of separate supervisory agencies and external experts on the decision-making committee, drawing on different policy-making perspectives (IMF-FSB-BIS 2016). The People's Republic of China, the Republic of Korea, Japan, and Australia are among the countries using this kind of institutional setup.

Figure 2: The Committee or Council Structure



Source: Krishnamurti, Damodaran, and Yejin Carol Lee. 2014. "Macroprudential Policy Framework: A Practice Guide." Washington, DC: World Bank.

Egawa, Otani, and Sakiyama (2015) explained that the choice of governance structure depends on various factors such as economic and financial characteristics, exchange rate regime, and degree of democracy. Their quantitative analysis shows that advanced economies are more likely to adopt the committee structure (where coordination is done by government), while the central bank structure is the majority choice among emerging market economies.

How macroprudential policy is carried out depends on the institutional arrangement as well as the powers each component wields. One must consider whether the macroprudential policy will be subject to a rule-based framework for effective implementation or will be conducted under the sole discretion of the macroprudential authority. Gadanecz and Jayaram (2015) note that, though transparent and easy to communicate, a rule-based approach may not be appropriate when changes in the institutional setup result from new policies. Authorities may need some policy discretion, especially when information is rather limited.

Regardless of institutional structure, macroprudential authorities should ensure that mitigation measures against possible pitfalls are in place and should be accountable for any decisions made to corresponding legislative bodies or the general public.

B. Macroprudential Indicators: Risk Detection and Assessment

Central to the foundation of a macroprudential policy framework is to be able to identify risks and prevent any buildup that may harm financial stability. These risks include disruptions to financial services such as credit intermediation, risk management, and payment services that reflect deficiencies in the financial system.

Risks can be amplified by financial cycles as well as the increasing complexity of financial institutions and markets. Macroprudential policy must be able to address the tendency of financial variables to fluctuate around a trend throughout a financial system's cycle—its time dimension. And it must aim to address common exposures and interlinkages among financial institutions in addressing aggregate risk as the structure of the financial system deepens—its cross-sectional dimension.

There is no better approach to macroprudential policy than to ensure early detection of emerging systemic risks. That way the macroprudential authority will be able to act quickly to mitigate or contain risk and prevent a crisis developing. Building the capability for early risk detection is not easy, however. Macroprudential surveillance requires monitoring the behavior of broad aggregate numbers to identify potential vulnerabilities that might affect the whole financial system (Yam 2006). It requires a great deal of information and data from various sources that can be continuously analyzed and assessed. Aside from identifying looming risks, these early warning indicators also guide macroprudential policy makers on the timing of when to apply and when to remove macroprudential measures.

Wolken (2013) identified five features of a good indicator. It must be relevant, accurate, collectable, comprehensive and dynamic, and forward looking. Authorities should prioritize identifying and monitoring indicators that reflect their financial system structure, and ensure the required data is both readily available and accurate. Indicators that allow monitoring nonbank segments of the financial system are essential to form a more holistic view of the system. Caruana (2010) suggested expanding the scope of macroprudential surveillance to cover unregulated state-owned financial entities, development finance institutions, finance companies, and hedge funds, among others; as well as those less regulated, like credit unions, microfinance institutions, cooperative banks, mutual funds, and

pension funds. Meanwhile, an indicator must be forward looking to provide an early warning of budding financial stress that may require policy action.

1. Database Construction and Management for Macroprudential Indicators

Macroprudential policy decisions must be based on relevant, and reliable information. Thus, building a database covering several financial and macroeconomic indicators is needed for quick, in-depth assessment and analysis.

In the euro area, for example, the European Central Bank maintains a macroprudential database handling a comprehensive and harmonized data set of indicators that cover various submodules of variables relevant for macroprudential analysis.[2] In New Zealand, the Reserve Bank of New Zealand updates key macroprudential indicators quarterly—known as chart pack—to aid in its assessment of the financial system and its policy actions. The chart pack includes information on credit and asset prices, bank leverage and risk taking, funding and liquidity, financial market conditions, housing market imbalances, household balance sheet stretch, lending standards, farm market imbalances, farm balance sheet stretch, commercial property imbalances, business balance sheet stretch, and some aggregate indicators such as credit-to-gross domestic product (GDP) gaps, among others.

2. Creating a Structured List of Macroprudential Indicators

Indicators must be able to determine the type of risks that could threaten financial system soundness. For the banking sector, the elements of solvency risk, funding risk, and currency risk are among the leading indicators monitored. To get a broader view, authorities also monitor elements of risks outside banking, including household and corporate indebtedness or leverage, mortgage, securitization, and credit derivatives markets, along with the size of unhedged foreign currency exposure outside the financial system. Appendix 1 presents a list of indicators authorities might track, categorized by source of risk.

Once indicators are chosen and monitored, the next step is to set warning thresholds to identify risk buildup and trigger thresholds that signal when to activate macroprudential measures. In setting thresholds, policy makers need to consider the inherent trade-off between missing crises (if thresholds are set too high) and receiving false alarms (if thresholds are set too low) (ESRB 2014).

3. Quantitative Methods for Analyzing Macroprudential Indicators

While individual indicators may partially reflect certain imbalances in the financial system, it helps to assess the system's soundness using a composite of related indicators. Combining information from multiple indicators can provide better and stronger signals of a buildup of vulnerabilities and risks (ESRB 2014). Authorities often construct risk maps based on composite indexes of relevant indicators covering several dimensions of financial soundness—such as profitability, leverage, liquidity, and turnover, among others. To construct a composite index of related indicators, individual indicators are first converted into standard normal variables. The standardized variables are then bounded between

[2] These include variables covering macroeconomic and financial markets, debt and credit, residential real estate, commercial real estate, banks, nonbanks and those that define interconnectedness (for example, banks' interbank liabilities and derivative positions). See https://sdw.ecb.europa.eu/browse.do?node=9689335 for further details.

0 and 1 using relative distance transformation. Related indicators are aggregated using principal component analysis.

Aside from risk maps, there are also several analytical approaches and models that use monitored macroprudential indicators. Holopainen and Sarlin (2016) document all existing early warning models ranging from simple univariate and bivariate signaling to advanced machine-learning methods such as k-nearest neighbors and neural networks, and the use of a model aggregation approach.[3] An aggregation of bank-level logit model uses 11 indicators: leverage ratio, reserves to assets, interest expenses to liabilities, pretax income to assets, short-term investments to liabilities, financial assets to GDP, loans to deposits, issued debt to liabilities, house price gap, net international investment position, and 10-year yield. These kinds of formal procedures for quantitative analysis of systemic risks remain at an early stage in developing Asian countries like Cambodia, Mongolia, Myanmar, Sri Lanka, and Viet Nam. Lack of data availability and technical capacity— macroprudential surveillance remains in its infancy in these countries—are major challenges in creating similar formal quantitative analysis.

For transparency, many economies publish financial stability reports that provide general assessments of the whole financial system, including any need for policy action. This is a biannual assessment of a country's financial soundness that identifies any potential risks to stability. Sri Lanka prepares a Financial System Stability Review that details the country's credit, liquidity, interest rate, and foreign exchange risks, along with capital adequacy, profitability, resilience to shocks, and the insurance sector, among other general financial system conditions. Viet Nam's Financial Stability Assessment Program provides a comprehensive review of its financial system, specifically the banking sector, with accompanied policy recommendations that aim to improve financial system infrastructure and health. Mongolia is being assisted by the International Monetary Fund (IMF) in assessing the country's financial system through its Financial System Stability Assessment publication. Cambodia and Myanmar have yet to publish their own reports on general financial system conditions.

C. Systemically Important Financial Institutions

In terms of controlling and lowering the cross-sectional dimension of risk, systemically important financial institutions (SIFIs) play an important role. Bank examinations and offsite monitoring of bank safety and soundness enable bank supervisors to detect and act to curtail excessive risk-taking, which could threaten the stability of an individual bank (Zamorski and Lee 2015b). If a bank is large or provides critical services, it may be considered an SIFI—meaning problems at that institution could escalate or be of sufficient magnitude to affect the overall stability of the financial system.

Hannoun (2010) suggested several criteria that define SIFIs (sometimes referred to as the "too big to fail"):

(i) size;
(ii) interconnectedness;
(iii) substitutability—where services are critical to the smooth operation of the financial system, such as clearing and settlement;
(iv) concentration—that indicates few, large players dominate a market for financial services; and

[3] See Holopainen and Sarlin (2016) for a more detailed discussion.

(v) common exposures—where financial institutions may hold positions similar to competitors, suggesting a common shock could create distress at multiple institutions simultaneously.

These characteristics stress the need for macroprudential policy to effectively handle SIFIs. Hannoun (2010) also notes the associated moral hazard, suggesting the need to "bail in" shareholders and creditors rather than bail out SIFIs.

D. Macroprudential Stress Tests

The GFC spurred interest in conducting stress tests. But many consider microprudential stress tests insufficient to expose financial system vulnerabilities. Thus, general principles for designing and conducting macroprudential stress tests must be developed. This requires a more holistic view of the financial system.

Macro stress testing became a vital component of macroprudential surveillance in Asia through a joint program of the IMF and World Bank known as the Financial Sector Assessment Program (FSAP).[4] Macro stress testing enables economies to assess how the financial sector as a whole responds to significant shocks such as interest rate and exchange rate movements. Gradually, central banks and monetary authorities in Thailand, Malaysia, and the Philippines modified some FSAP components and conduct stress tests independently. In 2009, the Central Bank of Sri Lanka officially started quarterly stress tests (Siregar 2011).

Greenlaw et al. (2012) lists essential elements of a macroprudential stress test (Table 2). To design more effective macroprudential stress tests, Demekas (2015) stressed the need to incorporate general equilibrium dimensions where the outcome depends not only on the size of the shock and buffers of individual institutions, but also on their behavioral responses and interactions with each other and other economic agents.

Table 2: Elements of a Macroprudential Stress Test

Purpose	The goal is to limit the likelihood and costs of aggregate fire sales, credit crunches and systemic defaults.
Scope	The test examines the entire financial system. Any entity that contributes to fire sales, whose default has follow-on effects, or which can exacerbate a credit crunch should be included.
Liability considerations	Because a run can lead to a credit crunch or fire sale, the scale of wholesale funding that is run-prone is paramount. Capital adequacy depends on the health of the overall financial system.
Asset considerations	The test indicates whether the financial system is vulnerable to deleveraging that might amplify adverse shocks.
Output	Develop guidance about whether to close a bank and when to sell its assets to maximize taxpayer recovery.

Source: Greenlaw, David, Anil K. Kashyap, Kermit Schoenholtz, and Hyun Song Shin. 2012. "Stressed Out: Macroprudential Principles for Stress Testing." Chicago Booth Paper No. 12-08.

[4] Conthe and Ingves (2001) defined FSAP as a comprehensive health checkup of a country's financial system.

E. Macroprudential Policy Instruments

An effective macroprudential policy framework ensures the use of appropriate macroprudential policy instruments or tools. The choice of measures mainly depends on the risks identified and its consequences, notwithstanding other factors, including macroeconomic policies already in place.

Macroprudential policy instruments fall into three broad categories depending on macroprudential objectives. First, to reduce risks from excessive credit or credit growth, authorities can apply credit controls—such as caps on the loan-to-value (LTV) ratio, caps on the debt-to-income (DTI) ratio, caps on foreign currency lending, and ceilings on credit or credit growth. Second, to constrain funding or liquidity risks, liquidity-related instruments include limits on net open currency positions or currency mismatches, limits on maturity mismatches, and reserve requirements. And third, to build sufficient buffers to withstand the cycle, capital-related tools can include countercyclical capital requirements, time-varying/dynamic positioning, and restrictions on profit distribution. Lim et al. (2011) summarize a conceptual basis for different macroprudential policy instruments (Appendix 2).

Essentially, authorities know financial stability cannot be achieved by macroprudential policy alone. Macroprudential policy is more effective when complemented by other macroeconomic policies. In short, macroprudential policy will not be effective if it compromises existing macroeconomic policies. For example, to constrain rapid real estate credit growth and asset price inflation, Singapore and Hong Kong, China imposed taxes on real estate transactions in conjunction with lowering the LTV ratio (Lim et al. 2011). Hannoun (2011) offers a matrix on how to effectively integrate policies (Table 3).

Table 3: Policy Areas and Contributions to Financial Stability

Policy Area	Primary Objective	Financial Stability Objective
Prudential	Limit distress of individual financial institutions	Address systemic risk (cross section, over time)
Monetary	Stabilize prices	Lean against boom–bust cycles in credit and asset prices
Exchange rate	Stabilize exchange rate	Reduce capital flow volatility
Fiscal	Manage demand countercyclically	Maintain fiscal buffers that allow a response to financial system stress

Source: Hannoun, Hervé. 2010. "Towards a Global Financial Stability Framework." Speech delivered at the 45th SEACEN Governors' Conference. Siem Reap, Cambodia. 26–27 February.

Timing is another main consideration for using macroprudential tools—one cannot wait until a bubble is about to burst. Hannoun (2010) emphasized symmetry in implementing policies, including macroprudential policy—which has an effect during both boom and bust phases of financial and business cycles. This is particularly important when applying countercyclical macroprudential tools—to build up capital buffers in good times that can be run down during bad times. To improve timing, authorities need to develop a comprehensive framework to monitor macroprudential conditions and establish appropriate warning and trigger thresholds.

Other considerations in choosing macroprudential tools are country specific. One must consider the structure of the financial system and its complexity, along with levels of financial integration and openness, for example. Authorities may find different and better ways of implementing policy measures. There is no single workable solution; no one size fits all measure.

III. MACROPRUDENTIAL POLICY EXPERIENCES OF SELECTED COUNTRIES AND REGIONS

This section describes the experiences of several economies and regions in implementing macroprudential policy measures that could offer some useful lessons for developing Asian economies in the process of building and improving their respective frameworks.

A. Republic of Korea

The Bank of Korea (BOK) is mandated to ensure financial stability in the revised 2011 Bank of Korea Act. This strengthens the BOK role in macroprudential policy making aside from its traditional role in setting monetary policy. In response, the BOK established the Macroprudential Analysis Department which formulated a framework for monitoring macroprudential conditions.

The general macroprudential policy framework of the Republic of Korea requires an in-depth understanding of macroprudential conditions. Authorities take a holistic view of macroprudential conditions by considering both vulnerabilities and resilience—the system's capacity to absorb shocks. This approach helps define the policy direction macroprudential authorities take, particularly when activating specific measures. The BOK's choice of tools to use is anchored on the assessment of macroprudential conditions.

The BOK monitors macroprudential conditions and assesses the resilience of the entire financial system through its Financial Stability Report (FSR) and Systematic risk assessment model for macroprudential policy (SAMP). The FSR provides relevant agencies and all financial market participants with essential information on the financial system. The FSR (i) analyzes and evaluates potential risk factors in the financial system, (ii) provides early warnings of increasing risks to policy authorities and market participants, and (iii) enables the BOK to respond early to the accumulation of systemic risk by suggesting policy alternatives as needed (Kim 2014). The BOK continues to refine the available macroprudential tools to better reflect country-specific circumstances and advances in the country's financial structure. In addition, the BOK encourages feedback from external experts to further develop the quality of its reporting.

Meanwhile, SAMP was developed to monitor financial resilience against external shocks by estimating macrorisk factors, bank profits and losses, and default and liquidity contagion losses from bank interconnectedness over multiple periods (Kim 2014) (Table 4). SAMP also analyzes the effects stemming from Basel III regulations, liquidity provision and recapitalization requirements; and evaluates domestic systemically important banks by measuring individual bank contributions to systemic risk. The BOK has improved on the SAMP by, for example, adding an assessment module related to foreign currency liquidity risk, and is planning to develop a macrofinancial linkage module and expand coverage to nonbanks.

The country's macroprudential policy measures are designed and applied in response to various sources of economic risks—such as procyclicality of household and corporate lending and volatility of capital flows, among others (Kim 2014).

In 2002, the Republic of Korea introduced an LTV ratio cap to counter risks associated with growth in mortgage loans; and after noting the limitations of LTV ratio regulation, a DTI ratio regulation was introduced in 2005 (Appendix 3). Both measures are used flexibly depending on developments in housing prices and mortgage lending. According to simulations by Kim (2013), LTV ratio and DTI ratio

regulations effectively curb increases in mortgage loans and housing prices during expansionary phases;[5] and by empirical analysis, Lee, Asuncion, and Kim (2016) showed that credit-related macroprudential tightening such as caps on LTV and DTI ratios effectively reduce housing price inflation with lags, leverage growth, as well as dampened credit expansion.

Table 4: Elements of Systematic Risk Assessment Model for Macroprudential Policy

Module	Activities/Elements
Macrorisk factor module	Estimation of joint probability distribution of macrorisk factors Macroeconomic model (BVAR) Time-varying volatility (GARCH) Comovement and dependence (Copula) Risk modeling based on EVT
Bank profit and loss module	Credit or market losses Interest or noninterest income Loan loss provisions Fundamental default
Default contagion module	Fire sale losses Credit crunch losses Interbank credit losses Defaults due to loss contagion
Funding liquidity contagion module	Deleveraging or liquidity withdrawals Fire sale losses Credit crunch losses Higher funding costs Defaults due to funding liquidity contagion
Multiperiod module	Repeat measurement process until *t+4* period
Systemic risk measurement module	Estimation of number of defaulting or distressed banks Estimation of loss distributions of individual banks or banking system

BVAR = Bayesian vector autoregressive model, EVT = extreme value theory, GARCH = generalized autoregressive conditional heteroskedasticity.
Source: Choongsoo, Kim. 2014. "Macroprudential Policies in Korea: Key Measures and Experiences." https://www.banque-france.fr/fileadmin/user_upload/banque_de_france/publications/Financial-Stability-Review-18_2014-04_Kim.pdf

In October 2010, the country introduced a foreign exchange-related measure by placing leverage caps on banks' forex derivatives positions—to curb risks from currency and maturity mismatches arising from excessive forex forward sales by companies. The leverage caps were initially set at 250% of capital for foreign bank branches and 50% for domestic banks, and were tightened later to 200% and 40%, respectively, in July 2011, and further to 150% and 30% in January 2013 (Appendix 3). This measure was found to effectively reduce banks' foreign borrowings and improve maturity structures.

B. New Zealand

The macroprudential policy framework in New Zealand was established upon signing of the "Memorandum of Understanding (MOU) on Macroprudential Policy" between the Governor of the Reserve Bank of New Zealand (RBNZ) and the Minister of Finance in May 2013. The MOU clearly defined the parameters of macroprudential policy including its objective, goals, governance framework and tools available (Table 5).

[5] For example, without the macroprudential measures, housing prices and mortgage loans outstanding would have been 75% and 137% higher, respectively, than their actual levels at the end of the second quarter of 2012.

The MOU also delineated the functions of relevant agencies and authorities. The Governor of the RBNZ, upon consultation with the Minister of Finance, finalizes macroprudential policy decisions. The Governor must inform the Finance Minister of any conditions that might warrant a future macroprudential policy response.

The governance approach in New Zealand is based on "guided" discretion. Rogers (2013, 17) described this approach involving a "healthy dose of policymaker judgment." This approach involves assembling a combination of quantitative and qualitative information before making any judgment on actions to be taken.

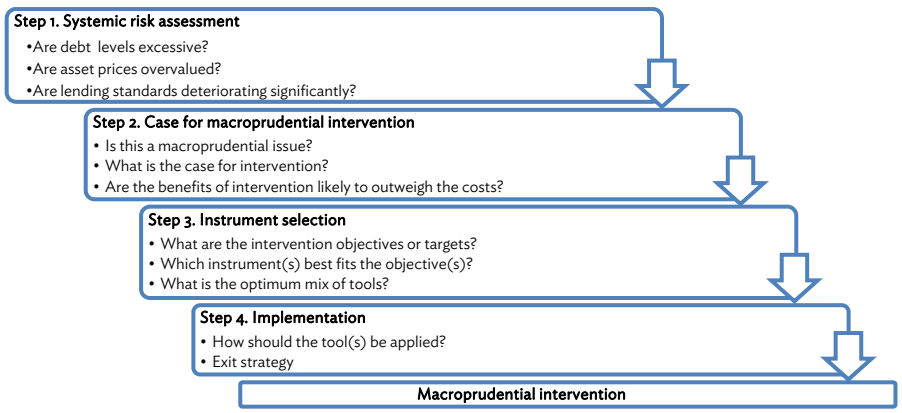
Table 5: Key Elements of the Memorandum of Understanding on Macroprudential Policy

	Key Elements
Objective	Increase financial system resilience and counter instability.
Goals	Provide financial system with additional buffers Dampens extremes in the credit cycle and capital market flows
Governance	Reserve Bank of New Zealand Governor, Minister of Finance Financial Stability Report Reserve Bank of New Zealand Act
Instruments	Core funding ratio Countercyclical capital buffer Sectoral capital requirements Loan-to-value restrictions

Source: Rogers, Lamorna. 2013. "A New Approach to Macro-Prudential Policy for New Zealand." *Reserve Bank of New Zealand Bulletin* 76 (3).

Macroprudential policy making in New Zealand generally involves four key steps (Figure 3). The RBNZ assesses the financial system as a whole and identifies potential risks. In practice, it focuses on debt levels, asset price imbalances, and lending standards. These indicators are adjudged as to whether they are deteriorating or improving based on a range of quantitative and qualitative information. The selection and implementation of macroprudential tools will follow if assessments show a need for macroprudential intervention. The selection of macroprudential instruments often depend on the type of risk being addressed.

Figure 3: Steps in Macroprudential Policy Making



Source: Rogers, Lamorna. 2013. "A New Approach to Macro-Prudential Policy for New Zealand." *Reserve Bank of New Zealand Bulletin* 76 (3).

There are four macroprudential instruments that cover the MOU's objective and goals: (i) adjustments to the core funding ratio, (ii) countercyclical capital buffer, (iii) adjustments to sectoral capital requirements, and (iv) quantitative restrictions on the share of high LTV ratio loans in residential property (Table 6)

Table 6: Macroprudential Policy Instruments

Instrument	Description	How the tool works	Potential issues
Adjustments to the core funding ratio	Varies the share of lending that banks are required to fund out of stable or "core" funding sources over the cycle to reduce vulnerability to disruptions in funding markets.	Reduced share of short-term funding increases the amount of time that banks are able to withstand stress in funding markets; easing in times of stress could also provide a safety valve for the system.	Potential leakages if banks opt to run down voluntary buffers. May also increase banks' vulnerability to term funding market shocks if not eased in a timely fashion.
Countercyclical buffer	Requires additional capital when "excessive" private sector credit growth is leading to a buildup of systemwide risk.	Creates additional capital buffer that can be used to absorb losses and allow banks to continue lending in the downswing.	Welfare costs partly mitigated by "price-based" nature; potential leakages if banks opt to run down voluntary buffers.
Adjustments to sectoral capital requirements	Requires additional capital against lending to a specific sector or segment in which excessive private sector credit growth is leading to a buildup of systemwide risk.	Provides additional capital buffer and may alter relative attractiveness of lending to targeted sector.	Welfare costs partly mitigated by "price-based" nature; potential leakages if banks opt to run down voluntary buffers. Could be subject to avoidance.
Quantitative restrictions on the share of high loan-to-value ratio loans to the residential property sector	A restriction on the share of new high loan-to-value ratio residential mortgage lending.	Likely to have greatest impact on the cycle, as it directly acts on the supply of bank lending. May also build resilience due to stronger bank balance sheets and less financially vulnerable households.	Likely to have the highest welfare costs, although mitigated by "speed limit" approach. Greatest regulatory coverage as it applies to all registered banks, but greater effectiveness could also increase incentives for avoidance and/or leakage to unregulated financial intermediaries.

Source: Rogers, Lamorna. 2013. "A New Approach to Macro-Prudential Policy for New Zealand." *Reserve Bank of New Zealand Bulletin* 76 (3).

In October 2013, New Zealand introduced an LTV ratio cap on housing loans with LTV ratios above 80%—in response to rising house prices that caused excessive ratios of house prices to income or rents—and lending to borrowers with less than 20% equity. Following implementation of said measures there was a sharp fall in loans with high LTV ratios since, and they have remained manageable (Table 7).

Table 7: New Residential Mortgage Lending, August 2013–October 2016

	Total New Commitments	LTV Ratio 80% or below	LTV Ratio above 80%	Exempt above 80% LTV Ratio[a]	Above 80% LTV Ratio Share before Exemptions[b]	Above 80% LTV Ratio Share after Exemptions[c]
	($NZ millions)				(%)	
Aug 2013	4,472	3,336	1,136	40	25.4	24.7
Sep 2013	4,735	3,549	1,187	41	25.1	24.4
Oct 2013	4,555	3,970	585	68	12.8	11.5
Nov 2013	4,435	4,124	310	59	7.0	5.7
Dec 2013	4,509	4,258	251	48	5.6	4.6
Jan 2014	3,090	2,942	147	37	4.8	3.6
Feb 2014	3,863	3,663	200	54	5.2	3.8
Mar 2014	5,262	5,008	254	67	4.8	3.6
Apr 2014	4,670	4,417	253	54	5.4	4.3
May 2014	4,797	4,469	328	78	6.8	5.3
Jun 2014	4,499	4,141	358	61	8.0	6.7
Jul 2014	4,685	4,316	369	68	7.9	6.5
Aug 2014	4,024	3,713	311	54	7.7	6.5
Sep 2014	4,264	3,906	359	52	8.4	7.3
Oct 2014	4,884	4,467	418	74	8.5	7.1
Nov 2014	5,109	4,668	441	79	8.6	7.2
Dec 2014	5,531	5,075	455	82	8.2	6.8
Jan 2015	3,565	3,308	257	53	7.2	5.8
Feb 2015	4,628	4,280	347	70	7.5	6.1
Mar 2015	6,314	5,882	432	69	6.8	5.8
Apr 2015	5,657	5,267	390	64	6.9	5.8
May 2015	6,162	5,678	484	70	7.9	6.8
Jun 2015	5,745	5,283	462	79	8.0	6.7
Jul 2015	6,010	5,518	492	100	8.2	6.6
Aug 2015	5,940	5,491	449	81	7.6	6.3
Sep 2015	6,500	6,046	454	80	7.0	5.8
Oct 2015	5,853	5,377	476	77	8.1	6.9
Nov 2015	6,415	5,877	537	–	8.4	–
Dec 2015	6,001	5,498	504	–	8.4	–
Jan 2016	4,117	3,774	343	–	8.3	–
Feb 2016	5,166	4,725	441	–	8.5	–
Mar 2016	6,572	6,055	517	–	7.9	–
Apr 2016	6,504	6,010	493	–	7.6	–
May 2016	7,287	6,791	496	–	6.8	–
Jun 2016	6,803	6,348	455	–	6.7	–
Jul 2016	6,305	5,873	431	–	6.8	–
Aug 2016	6,107	5,688	419	–	6.9	–
Sep 2016	5,831	5,453	378	–	6.5	–
Oct 2016	5,369	5,030	338	–	6.3	–

LTV = loan to value.

[a] Figures include the construction lending exemption.

[b] Percentages are calculated from nonrounded figures.

[c] The "high LTV ratio share after exemptions" is calculated by subtracting exempt lending (with LTV ratio above 80%) from new commitments then dividing by total new commitments less exempt lending (with LTV ratio above 80%). Though similar, it is not the same as the high LTV ratio "speed limit." Banks' compliance with the "high LTV ratio" speed limit will initially be measured against the average "high LTV ratio share after exemptions," from 1 October 2013 to 31 March 2014. Thereafter, it will be measured against the 3-month rolling average for the larger banks (ANZ, ASB, BNZ, Kiwibank, and Westpac) and the 6-month rolling average for the smaller banks. Percentages are calculated from nonrounded figures.

Source: Reserve Bank of New Zealand.

The MOU also incorporates considerable checks and balances in the framework. These include (i) publication of the Financial Stability Report twice a year, which is reviewed by the Parliament's Finance and Expenditure Committee and the Board of Directors of the RBNZ; (ii) publication of regulatory impact assessments of any macroprudential policy implemented, and the corresponding public consultation on any such measures; and (iii) monitoring and oversight by the Board of Directors of the RBNZ, which acts as agent to the Minister of Finance in evaluating how well the RBNZ carries out its legislative responsibilities (Rogers 2013).

C. Singapore

As a large global and regional financial hub, Singapore can be exposed to a slew of domestic and global risks. Thus, authorities developed its macroprudential policies to moderate financial stability risks, recently with special focus on the housing market.

Singapore follows central structure approach where macroprudential policy making is assigned to central banks through a dedicated committee. The Monetary Authority of Singapore (MAS) regulates and supervises the financial system of Singapore and is responsible for both microprudential and macroprudential policies thru the Board-level Chair's Meeting, which the MAS Chair presides. Macroprudential policy making in Singapore requires a great deal of collaboration with relevant agencies such as the Ministry of Finance, Urban Redevelopment Authority and the Housing Development Board (IMF 2013).

The MAS has developed a risk assessment methodology for all financial institutions—the Common Risk Assessment Framework and Techniques—to evaluate institutional risk regardless of the financial services it provides. Common Risk Assessment Framework and Technique uses the main business activities of the financial institution as basic units of risk assessment, which can be applied flexibly, yet consistently, to all types of financial institutions (MAS 2007).

The MAS conducts stress testing that measures portfolio, institution, or financial system sensitivity to exceptional but plausible shocks affecting banks and insurance. Also, the MAS applies measures to mitigate risk posed by the island's myriad foreign branches. For approving foreign entrants, it applies the same prudential qualifications as domestically incorporated banks. The MAS limits the number of foreign branches permitted to accept retail deposits and recently adopted a program that requires qualifying banks with large retail operations to locally incorporate their business (IMF 2013).

Although well regulated, some financial stability risks have emerged in recent years—stemming from surging real estate prices that now surpassed their 2008 peaks (Lee, Asuncion, and Kim 2016). There is concern these trends could rekindle inflation expectations and threaten financial stability, especially given the ease of obtaining credit. Authorities continue to proactively respond to new sources of systemic risk, enhancing their surveillance and analytical frameworks for assessing the likelihood and impact of emerging systemic risks (Lee, Asuncion, and Kim 2016).

The MAS has used several macroprudential instruments to mitigate systemic risks arising, in particular, from the housing market (Appendix 4). Since 2009, the MAS has introduced a series of measures to ensure property market stability and to encourage financial prudence among borrowers (MAS 2016). Singapore tightened the limit on the ratio of mortgage service to income, capped the LTV ratio, imposed an additional buyer's stamp duty, and increased the minimum cash down payment. These measures largely target the more speculative market segments, but further tightening has been recommended on the segment owned mainly by foreigners and permanent residents. The measures

were found to have been broadly successful in achieving macroprudential goals. Housing price inflation has moderated and housing affordability metrics remain contained.

Private residential property prices have declined gradually—overall prices declined on average 0.9% each of 10 consecutive quarters from its peak in the third quarter of 2013. Transaction volumes on new sales, resales and subsales dropped, improving the risk profile of housing loans. The stress tests conducted by the MAS reflect the resilience of the general banking system for potential sharp corrections in property prices (MAS 2016). The effectiveness of its macroprudential policies can be affected by the degree of international financial integration. Singapore's highly developed and globally interconnected financial system with a large foreign bank presence makes it more difficult to circumvent some macroprudential policies, but most measures have focused primarily on the property market—that smoothed housing prices and credit expansion without damaging leverage growth.

D. Indonesia

Macroprudential policy in Indonesia centers on monitoring vulnerabilities in the financial sector and detecting potential shocks to financial system stability. Holding the macroprudential role, the Bank of Indonesia (BI) continuously develops early warning indicators using in-house research. Monitoring exercises support relevant authorities' decisions on which actions can best address identified potential financial disturbances.

The Financial Services Authority (Otoritas Jasa Keuangan, or OJK) Law provides the macroprudential policy framework and specifies that macroprudential supervision falls under the BI (FSB 2014).[6] The OJK supervises financial institutions (including Indonesian banks and domestic branch offices of foreign banks) and is mandated for microprudential assessments (Utari and Arimurti 2012) (Table 8).

Table 8: Agency Roles in Financial Stability

Agency	Role
Bank Indonesia	Monetary policy and financial stability (macroprudential)
Financial Services Authority	Supervision of banks, nonbank financial institutions and capital markets (microprudential)
Indonesia Deposit Insurance Corporation	Deposit insurance system
Ministry of Finance	Fiscal policy

Source: Batunanggar, Sukarela. 2013. "Macroprudential Framework and Measures: The Indonesian Experience." In *Macroprudential Frameworks in Asia,* edited by Rodolfo Maino, and Steven A. Barnett, 1–5. Washington, DC: International Monetary Fund.

In their peer review report, the FSB (2014) cited some weaknesses in its framework—it was not fully clear how the framework would function where microprudential tools could be used for macroprudential purposes or in the decision-making process. It suggested better communication and coordination was needed. Batunanggar (2013) emphasized that to establish a well-functioning macroprudential framework, the BI should take the lead role in systemic risk monitoring and assessment in conducting macroprudential policy and within the Financial System Stability Forum. The OJK, on the other hand, should drive the implementation of all prudential tools. The effect was to better, clearly define all key elements of an effective macroprudential policy framework—institutional

[6] Law No. 21 of 2011 ("Law No. 21").

and governance arrangements, powers, instruments as well as the accountability framework of relevant authorities.

Policy makers in Indonesia face a complex challenge in managing strong domestic demand in an uncertain global economic and financial environment. The key question is how to balance price stability for sustainable growth while maintaining external and financial system stability—all taking into account highly volatile capital flows, exchange rates, and global commodity prices. This tripartite macroeconomic challenge meant more efficient coordination to avoid conflicts between policies that might weaken domestic demand (Lee, Asuncion, and Kim 2016). A mix of macroprudential and other macroeconomic policies has helped deal with the multiple challenges of preserving monetary and financial system stability. Macroprudential measures alongside monetary and exchange rate policies have been frequently applied since 2009. Utari and Arimurti (2012) described Indonesia's macroprudential policy tools as measures (i) imposed on a particular credit market, (ii) addressing capital flow volatility, (iii) managing domestic liquidity, and (iv) targeting balance sheet size or composition of banks and other financial institutions.

To help contain credit growth, the BI introduced macroprudential measures on property lending by tightening LTV ratio limits on mortgages for second and third residential properties in September 2013 (Appendix 5). This was followed by the introduction of tighter regulations on motor vehicles. Phased increases in secondary and loan-to-deposit ratio (LDR)-linked reserve requirements were also implemented (Batunanggar 2013).[7]

Caps on LTV ratios and minimum down payments for vehicle purchases slowed growth in housing and auto loans. However, Batunanggar (2013) noted the potential diversion of credit to multipurpose loans. Meanwhile, Lee, Asuncion, and Kim (2016) found that credit-related macroprudential tightening measures had an immediate effect on credit expansion, while they had a lagged impact on leverage growth. On the other hand, liquidity-related macroprudential tightening measures had no effect on dampening housing prices, but they had an instantaneous effect on credit expansion.

While current macroprudential measures appear adequate, Batunanggar (2013) recommends that banks with large restructured loans or heavy exposure to export-related and property sectors be more strictly monitored.

E. Euro Area

The GFC hit the euro area with huge economic losses (current GDP remains below its precrisis level and remains about 13% below its precrisis trend). Many important lessons were gleaned from the crisis—primarily shortcomings in financial supervision.

[7] In September, the BI raised the secondary reserve requirement—bank holdings of treasury and BI securities—from 2.5% to 4%, to be phased in by December 2013; it also tightened the LDR-linked reserve requirement by lowering its applicability to banks with an LDR in excess of 92% (from 100%) and with a capital adequacy ratio of less than 14%.

Amid the crisis, the European Commission created the European Systemic Risk Board (ESRB) in 2009 to conduct macroprudential oversight. In 2010, the ESRB formed part of a new European System of Financial Supervision together with European Supervisory Authorities.[8] The framework requires participation of the European Central Bank and national central banks to ensure complete and accurate ESRB assessment of risks and information about financial system developments.

In 2012, the ESRB proposed establishing national authorities with macroprudential mandates. In 2013, it recommended that members should provide macroprudential authorities the macroprudential instruments capable of reaching each of the intermediate objectives of macroprudential policy. The ESRB outlined four objectives of macroprudential policy to prevent or mitigate systemic risks: arising from (i) excessive credit growth and leverage, (ii) excessive maturity mismatch and market liquidity, (iii) direct and indirect exposure concentration, and (iv) misaligned incentives and moral hazard.

Instruments are identified by mapping them against the intermediate objectives (Table 9). In some cases, more than one intermediate objective were needed to address systemic risk.

Table 9: Macroprudential Instruments Mapped by Specific Objective

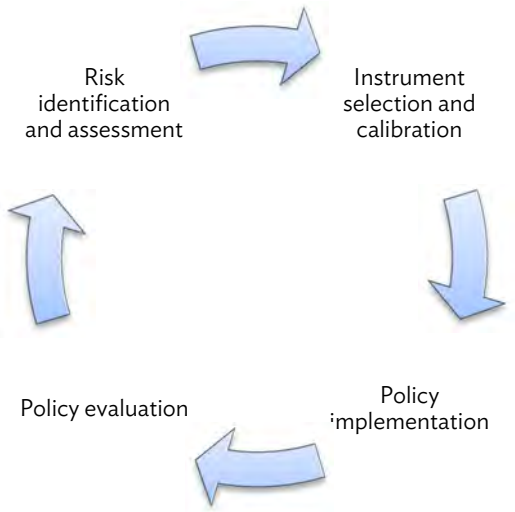
Objective	Instruments	Transmission channels
Address excessive credit growth and leverage	Countercyclical capital buffer	Resilience of banks; contribute to curbing excessive (sectoral) credit growth
	Capital instruments ▪ leverage ratio ▪ by sector (real estate, intrafinancial) ▪ systemic risk buffer	
	Loan-to-value/loan-to-income cap	Resilience of borrowers and banks, mitigate procyclicality mortgage credit
Address excessive maturity mismatch and market illiquidity	Stable funding restrictions (NSFR and LTD)	Resilience of funding base to stressed outflows
	Liquidity charges	
Address direct and indirect exposure concentration	Large exposure restrictions (by counterparty, sector, geographic)	Resilience to counterparty and concentration to sectors
Address misaligned incentives and moral hazard	SIFI capital surcharges—global systemically important institution and other systemically important institution buffers	Lower probability and impact of failure of SIFIs; increased resilience of banks
	Systemic risk buffer	

LTD = loan to depost, NSFR = net stable funding ratio, SIFI = systemically important financial institution.
Note: This list of instruments is not exhaustive. Moreover, instruments need not be limited to assigned risk categories. For example, the systemic risk buffer could also be used to mitigate risks other than those arising from misaligned incentives. Conversely, not all instruments will work equally well in addressing the risks they are associated with. For example, the countercyclical capital buffer may better address risks associated with excessive credit growth than those associated with excessive leverage. The transmission channels capture the primary effects of the instruments. Disclosure requirements can be used as a complementary instrument for all intermediate objectives to improve risk pricing and market functioning through transparency.
Source: European Systemic Risk Board (ESRB). 2014. "Flagship Report on Macroprudential Policy in the Banking Sector." https://www.esrb.europa.eu/pub/pdf/other/140303_flagship_report.pdf

[8] The European System of Financial Supervision is a robust network of national financial supervisors working in tandem with new European Supervisory Authorities to safeguard financial soundness of individual financial firms and protect consumers of financial services ("microprudential supervision").

Figure 4 shows how the euro area operationalizes macroprudential policy. It is essential to relate objectives to indicators and instruments.

Figure 4: Euro Area's Macroprudential Policy Cycle



Source: European Systemic Risk Board (ESRB). 2014. "Flagship Report on Macroprudential Policy in the Banking Sector." https://www.esrb.europa.eu/pub/pdf/other/140303_flagship_report.pdf

Indicators identify the risks and assess their severity. The risk identification stage determines the indicative thresholds. It is followed by instrument selection and calibration stage. Instruments help contain identified risks and prevent their buildup. Lastly, the evaluation phase assesses the impact of instruments to determine possible adjustments or deactivation. The framework requires exercising sound judgment when activating or deactivating instruments and in identifying their transmission mechanisms (ESRB 2014).

IV. MACROPRUDENTIAL POLICY FOR SELECT DEVELOPING ASIAN COUNTRIES

According to IMF (2011), macroprudential policies had been successfully used in several emerging market economies well before crisis episodes. Lee (2015) summarized four Asian countries that effectively prevented or addressed threats to financial stability by applying macroprudential measures, pointing out that macroprudential policies were specific to each economy given their different domestic circumstances. A set of different policies have proven effective for various types of macroeconomic risks.

While the use of macroprudential policy tools is growing rapidly, some developing Asian economies face greater challenges in establishing a macroprudential framework (Krishnamurti and Lee 2014). All Asian economies should devote resources to better monitor and understand their overall financial system developments (Posen and Véron 2015)—as financial instability can give rise to economic recession (Hteik 2012). To complement the growth potential of developing Asian economies, it is essential to maintain financial soundness and sustainable financial growth by establishing appropriate macroprudential frameworks for each economy.

Here we examine Cambodia, Mongolia, Myanmar, Sri Lanka, and Viet Nam, as they are expected to follow a high growth path over the medium term. High growth expectations hold direct implications on foreign capital flows as well as financial system requirements that may become sources of systemic risk. If left unchecked, growth potential may itself be at risk.

A. Cambodia

The GFC prompted authorities to establish a higher standard of prudential regulation to better deal with its developing banking operations and ultimately ensure financial stability. Several hurdles must be crossed.

1. Institutional Arrangements

There is still no formal legal basis that clearly defines the country's macroprudential policy framework. The National Bank of Cambodia (NBC) proposed amendments to the Central Bank Law and Law on Banking and Financial Institutions to clearly annunciate financial stability, including the role macroprudential policy should play. The proposed amendment is being discussed at the council of ministers. Once completed, the proposal will be sent to the National Assembly for endorsement (Pal 2013).

Currently, the macroprudential policy role is shared between the NBC and the Ministry of Economy and Finance, with NBC playing the lead role. A financial stability committee and financial stability unit was established to support NBC.

2. Systemic Risks Monitored

Cambodia's systemic risk assessment methodology is basic (Pal 2013). There has been no formal procedure, no specific quantitative or qualitative model employed to review systemic risk, and no macroprudential stress test used by the central bank.[9] Currently, Cambodia monitors indicators seen to be the major sources of vulnerability—from liquidity and solvency issues.[10] Leading macroeconomic indicators such as financial deepening, inflation, and money supply are likewise regularly checked. The country focuses on systemically important banks to identify systemic risk in the banking sector.

3. Instruments

For its part, the NBC acknowledges that the macroprudential measures being used are not "adequately comprehensive" (NBC 2015b, 9). This might be partially due to the lack of better risk assessment methodologies. This is an immediate concern as the country's banking system has rapidly developed both in scope and scale of operations. As would be expected, credit growth has steadily increased since 2013.

Cambodia is working to build a better macroprudential policy framework to maintain financial stability amid high growth expectations. Authorities are working to strengthen the implementation of prudential regulations, revising existing regulations, and issuing new ones (NBC 2015a).

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[9] A sample stress test was conducted with assistance from the IMF; but there were questions about its effectiveness and usefulness (Pal 2013).

[10] These include liquidity coverage, sources of funds, solvency ratios, and nonperforming assets.

Pal (2013) briefly summarized macroprudential policy instruments already used:

(i) reserve requirements, which serve as both monetary policy and prudential tools, have proven to be effective in mitigating credit expansion and providing reserves for liquidity shortages within banking institutions;
(ii) LTV ratios to curb credit expansion and risk-taking behavior of banking institutions;
(iii) caps on credit to high-risk sectors were adopted in early 2008 during the credit and real estate bubble, but were abolished in early 2009 to ease credit flows and stimulate growth;
(iv) monitoring currency and maturity mismatches as part of assessing currency and liquidity risks;
(v) additional capital buffers and provisioning have also been adopted to improve loss-absorbing capacity and to strengthen banking institution positions against possible shocks, especially against the impact of the GFC.

Nonetheless, Cambodia's macroprudential policy framework falls short of the fundamental characteristics of an effective framework—lacking a formal legal basis that clearly defines accountability and the improved technical capacity to apply an analytical approach to assessing the entire financial system and detect systemic risks.

B. Myanmar

Myanmar has undergone substantial economic and financial reforms with its new government in their pursuit to stimulate economic growth. Along this process of gearing their economy toward a market-based system with a globally integrated financial sector will expose the country to external risks and vulnerabilities. Thus Myanmar must safeguard its financial system stability.

1. Institutional Arrangements

Myanmar's banking and nonbanking sectors are not yet fully developed (Hteik 2012). The banking system is the most prominent and, as the core of its financial system, is the fulcrum of monetary policy. The Central Bank of Myanmar (CBM) is responsible for both monetary and financial stability as mandated under the Central Bank of Myanmar Law of 1990. The CBM adopts the CAMELS framework—an effective and simple supervisory framework comprising five components: (i) capital adequacy; (ii) asset quality; (iii) management soundness; (iv) earnings; (iv) liquidity; and (v) sensitivity to market risk.

2. Instruments

Under CBM supervision, the banking department conducts onsite examinations and offsite monitoring to regulate banking operations. The CBM currently requires banks to (i) have minimum reserve requirements of, for example, 10% of total deposits; (ii) maintain liquid assets against eligible liabilities of least 20%; (iii) keep risk-weighted assets less than 10 times the combined total of capital and reserves; and (iv) not lend more than 20% of their capital plus reserves to any single individual or enterprise (Hteik 2012).

3. Much Remains to Be Done

Financial stability will increasingly be an important catalyst for the country's economic development. The government must continue to undertake financial sector reforms that best meet and support the changing needs of the economy.

C. Viet Nam

With Viet Nam's growing international presence, increasing interconnectedness within the financial system and between banks and enterprises (ADB 2014), improving management of potential systemic risk has gained urgency.

1. Institutional Arrangement

Substantial progress has been made to improve the country's macroprudential policy framework. Decree 156/2013/ND-CP, issued during the latter part of 2013, redefined the functions, tasks, powers, and organizational structure of the State Bank of Viet Nam (SBV). In February 2014, SBV established a Monetary and Financial Stability Department responsible for analyzing, assessing, and implementing macroprudential policy, and introducing measures to prevent systemic risk in the financial system (ADB 2014).

2. Systemic Risks Monitored and Tools Implemented

The five general categories of risks being monitored include foreign currency exposure, credit, excess leverage, liquidity, and asset price risks. The SBV has mapped systemic risks to possible sources (Table 10).

Table 10: Sources of Systemic Risks

Risk	Sources
Foreign currency exposure risk	Dollarization, currency mismatch
Credit risk	Dollarization, high credit growth, interest rate volatility
Excessive leverage risk	Bank-dominant financial system, high credit growth
Liquidity risk	Maturity mismatch, lack of confidence
Asset price risk	Real estate loans, stocks-related loans

Source: Nguyen, Do Quoc Tho. 2012. "Implementing Macroprudential Policy: The Case of Vietnam." https://www.imf.org/external/oap/np/seminars/2012/macroprudential/pdf/III5Tho.pdf

To contain risks from the sources identified, several macroprudential tools were used. To address currency mismatches, limits or caps on open forex positions, foreign currency loans, and interest rates on foreign currency-denominated deposits were implemented. To mitigate high risk-taking and reduce interest rate volatility, SBV sets caps on interest rates on Vietnamese dong-denominated deposits. Credit growth limits (particularly to preidentified sectors such as property and stocks) aimed to slow systemwide credit growth (Nguyen 2012).

These macroprudential measures, according to Nguyen (2012), were complemented by appropriate monetary, microprudential, and structural policies. For example, to curb credit growth, monetary policy on reserve requirements is applied together with selected macroprudential tool.

3. Effectiveness of Macroprudential Policy

There is limited empirical evidence of how effective macroprudential measures have been in Viet Nam. Nevertheless, Nguyen (2012) noted success in slowing credit expansion (attributed from declining forex loans), decreasing business leverage, deflating asset prices, and waning currency mismatches, among others.

4. Further Developments Needed

Other things are needed before a well-functioning framework for macroprudential policy is in place. There should be a legal framework that clearly sets and defines the role macroprudential policy plays. Improved systemic risk supervision as well as systemic risk detection and assessment must be accompanied by good available data. In addition, a clear communications strategy will be established as a financial stability report is prepared (IMF 2016).

ADB technical assistance was used to support the Monetary and Financial Stability Department operations and help narrow identified gaps. The technical assistance seeks to improve the legal framework, systemic risk detection and assessment, mechanisms for intra-agency and interagency coordination and information exchange, and design options for instruments that best suit Viet Nam's circumstances and current stage of financial sector development (ADB 2014).

The institutional framework will benefit from a proposal to establish a Financial Stability Council, chaired by a deputy prime minister, to coordinate financial stability policies (IMF 2016).

D. Mongolia

Mongolia's economic reforms—such as liberalizing capital flows and foreign trade, among others—also opened the door for volatilities and possible contagion. The country faced financial vulnerabilities during the GFC. The increasing procyclicality of systemic risks, rising credit growth, asset price booms and banks' heightened risk appetite all point to the country's growing need to improve its macroprudential policy framework.

1. Institutional Arrangement

The current framework involves close coordination between the Bank of Mongolia, Financial Regulatory Commission, and the Ministry of Finance through a Financial Stability Council (FSC). The FSC holds the "duty to agree on macroprudential policy measures critical for sustained long-term economic growth and take coordinated measures."[11] The FSC was established by a 9 May 2007 joint decree by the Bank of Mongolia, the Ministry of Finance, and the Financial Regulatory Commission, with the primary objective of safeguarding financial stability by determining and managing financial risks.

[11] It is specified under the Mongolian Parliament Resolution No. 58, "Approving Monetary Policy Guidelines for 2012" effective 30 November 2011.

2. Macroprudential Measures Implemented

Sukhee and Byambasuren (2016) listed several macroprudential measures introduced to avoid risks that may cause financial instability. Macroprudential policy measures adopted in Mongolia are often aimed at managing volatilities associated with capital flows. These include the following:

(i) increase in the liquidity ratio (18% to 25% in 2011),
(ii) increase in the capital adequacy ratio (12% to 14% for 5 systemic banks),
(iii) limits on exposure concentration (not to exceed 20% of a bank's capital),
(iv) limits on net open currency positions (not to exceed 15% of a bank's equity capital),
(v) limits on maturity mismatches,
(vi) setting a reserve requirement on all deposits, and
(vii) reducing provisioning in times of crisis.

3. Limitations Identified

Maino, Imam, and Ojima (2013) deemed the legal foundations creating the FSC "rather ineffective" and identified several shortcomings: (i) entities responsible for macroprudential policies are not clearly identified; (ii) the FSC lacks a permanent secretariat, with only a limited number of persons at the central bank assigned to FSC activities; and (iii) a weak accountability mechanism as FSC recommendations and decisions will not hold the same legal stature as budget laws and the central bank law.

E. Sri Lanka

Responsible for ensuring soundness of the country's financial system, the Central Bank of Sri Lanka (CBSL) undertakes surveillance and oversight of the entire financial system to limit systemic risks that may lead to financial and economic crises (CBSL 2014).

To effectively carry out this function, the Financial System Stability Committee was established in 2002, headed by the CBSL Deputy Governor in charge of Financial System Stability, with members from different CBSL departments. They meet once a month to assess the health, resilience, and risk landscape of the financial system, and submit a report (with recommendations) to the Governor and the Monetary Board to aid in policy making.

1. Risk Assessment and Surveillance Mechanism

The country's macroprudential policy framework depends heavily on risk surveillance, monitoring several macroprudential indicators covering global and domestic developments in the macroeconomic and real sectors, financial markets (money, bond, foreign exchange, and equity markets), along with real estate and certain commodity markets, banks, other financial institutions, and the corporate sector (CBSL 2014). Composite indicators such as a Financial Stability Indicator, Macroeconomic Stability Indicator, Financial Market Stability Indicator, and the Banking Soundness Indicator were created.

Given the potential risks associated with increased interconnectedness among financial institutions, a network analysis is being conducted. Banking resilience is assessed through stress testing. The country also remains watchful of the risks associated from movements in the rupee exchange rate (CBSL 2014).

2. Macroprudential Measures Implemented

Over the years, several macroprudential tools have been activated, such as ceilings on credit growth, dynamic general provisions, time-varying capital requirements, time-varying margin requirements, reserve requirements, limits on net open foreign currency positions, caps on foreign currency lending and exposure limits.

The CBSL notes how effective or appropriate the policy mix of macroprudential measures with monetary or microprudential instruments. Examples include requiring licensed banks to increase capital on a staggered basis to support the economy's growth momentum and to build sufficient buffers to mitigate risks. They have imposed general provisions on performing and selected categories of loans and advances to mitigate credit risk in addition to specific provision requirements. They have set limits on bank exposure to equity markets by placing limits on margin trading and issuance of guarantees for initial public offerings. And they promote the safety and soundness of the banking system by requiring banks to adopt appropriate risk management standards to mitigate risks arising from possible volatility and asset price bubbles (CBSL 2014).

3. Transparency and Accountability

Transparency and accountability in the macroprudential policy framework is promoted through the annual CBSL Financial System Stability Review. It informs the public of the assessment of the whole financial system, identifying potential risks and vulnerabilities, as well as tools implemented and policies taken, along with an outlook assessment (CBSL 2014).

V. CONCLUSION

Establishing a stronger and more effective macroprudential policy framework is one of the main lessons learned from the GFC. Countries need a framework that is responsive to the changing global financial environment. Authorities should be able to identify new sources of systemic risk (such as innovative financial products), assess their likelihood and impact, and proactively respond by designing new policy instruments as they emerge (ADB 2014).

In a more complex global financial environment, how should the macroprudential policy frameworks be structured and/or further improved in developing Asia? This question holds important policy implications as evolving global growth trends impact Asia's emerging markets.

Cambodia, Mongolia, Myanmar, Sri Lanka, and Viet Nam are among developing Asia's economies with high growth potentials over the medium term. Consequently, these countries may become potential hotspots for increased capital flows. This requires a dedicated macroprudential policy framework to safeguard against risks involved in cross-border capital flows, among others.

Based on the review of current macroprudential policy practices in select developing Asian economies, three common needs become apparent:

(i) **Establish a macroprudential institutional framework based upon strong legal foundations.** A macroprudential policy framework founded this way holds several advantages. It gives appropriate powers to the institution mandated to build macroprudential policy, allowing future policy decisions to carry weight and become

binding. Alongside defined powers, there will be a stronger accountability mechanism, which will motivate macroprudential policy makers to perform better and come up with intelligent decisions built upon more solid evidence.

(ii) **Improve risk detection and assessment built on thorough analysis of the financial system as a whole, detecting and preventing the buildup of potential risks.** Selected developing Asian countries, in some ways, are constrained by data and information limitations useful in macroprudential policy making. Shinohara (2014) emphasized the need for Asian economies to improve early warning systems and build sufficient technical capacity to analyze systemic risk.

(iii) **Foster close coordination with other policy-making institutions.** Macroprudential policies will be more effective if complemented with appropriate monetary, fiscal, and other financial and structural policies.

Overall, a macroprudential policy framework must be formulated to respond appropriately to the latest economic developments and changing financial environment. In addition to known sources of systemic risks, macroprudential authorities must keep an eye on potential sources of risks—such as expected vulnerabilities associated with growing cross-border capital flows across emerging economies and from advanced markets. Empirically monitoring the effectiveness of macroprudential measures activated will also help countries devise more effective macroprudential policies better suited to addressing systemic risks. A more integrated world and growing Asian regionalism also call for more regional and international cooperation in the area of macroprudential policy experience (Shinohara 2014).

APPENDIX 1: LIST OF INDICATORS TO MONITOR

Category	Risk Sources	Indicators
Aggregate indicators	Financial system and economy at large	GDP growth rate (%) Trend in financial sector contribution to GDP Credit growth (%) Asset price growth (%) Inflation Current account deficit to GDP (%) Foreign currency reserves Fiscal deficit to GDP (%) Sovereign debt to GDP (%) Gross external debt to GDP (%) Short-term external debt to foreign currency reserves (%) Household: debt to GDP (%); leverage ratio; debt service-to-income ratio Corporate: debt to GDP (%); leverage ratio; debt service coverage ratio; ROE
Indicators of financial sector conditions	Aggregate risk	Credit-to-GDP ratio; deviation from long-term trend
	Solvency	Capital adequacy ratio Tier 1 capital ratio Core equity ratio Capital cushion (excess voluntarily maintained by banks above minimum requirement) Capital cushion after deducting NPLs
	Leverage	Nonrisk adjusted leverage ratio, including off balance sheet items
	Liquidity (aggregate and currencywise)	Liquid assets to short-term liabilities (%) Liquid assets to total assets (%) Liquidity and maturity mismatches (contractual and behavioral) Committed but undrawn liquidity facilities Costs of short-term market borrowing Turnover in the interbank market Average borrowing from the central bank's standing liquidity facilities
	Funding pattern	Reliance on wholesale funding Reliance on interbank market Loan to deposit "plus" capital (%) Cost of borrowing Maturity pattern Foreign currency component Undrawn funding facilities Concentration: counterparty, instrument, market
	Currency risk	Net open positions to regulatory capital (%) Unhedged currency risk in corporate and household sectors
	Asset quality	NPLs to total loans (aggregate and by sector) (%) Provision coverage (%) Rescheduled or restructured loans Extent of delinquency within one year after sanction
	Off-balance sheet risks	Activity in nontraditional off balance sheet items

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Appendix 1 continued

Category	Risk Sources	Indicators
	Shadow banking	Significance of risks in unregulated (and lightly regulated) sector/entities Extent of interlinkages between (i) banks and nonbanks; and (ii) regulated and unregulated entities
	Profitability	Return on assets ROE Share of noninterest income in total income Net interest margin
Indicators of market conditions	Developments in financial markets that may lead to generalized distress	Market turnover (and liquidity) Indicators of risk appetite (spreads and risk premia) Rating migration Capital flows: portfolio and long-term investments
Indicators of asset market conditions	Real estate (can be separate for housing and commercial real estate) (The early warning system (EWS) can also include similar indicators for other price sensitive asset classes, e.g., equity markets)	Mortgage loan growth (%) Mortgage debt-to-GDP ratio (%) Loan-to-value ratio (%) Repayment term (maturity) Proportion of variable rate mortgages Real estate prices (commercial and residential); old and new properties Price-to-rent ratio ROE vis-à-vis conventional financial savings
Indicators of concentration risk	Cross-sectional dimension; channels of contagion and amplification	Common exposures and interconnectedness among financial institutions (including nonbank financial institutions), sectors, markets - Aggregate exposure to top 25 counterparties - Aggregate bank exposure to unregulated financial entities - Aggregate exposure to sensitive sectors, asset classes, markets - Share of large exposures to total assets Common business models Common risk management models Common valuation models Common product structures or components Common risk mitigants (insurers, guarantors, collateral) Concentration of funding source (central counterparty; clearing houses; trade repositories) Systemically important instruments and markets

GDP = gross domestic product, NPL = nonperforming loan, ROE = return on equity.
Source: Krishnamurti, Damodaran, and Yejin Carol Lee. 2014. "Macroprudential Policy Framework: A Practice Guide." Washington, DC: World Bank.

APPENDIX 2: CONCEPTUAL BASIS FOR SELECT MACROPRUDENTIAL POLICY TOOLS

Instrument	Conceptual Basis
Caps on the LTV ratio	The LTV ratio imposes a down payment constraint on households' capacity to borrow. In theory, the constraint limits the procyclicality of collateralized lending since housing prices and households' capacity to borrow based on the collateralized value of the house interact in a procyclical manner. Set at an appropriate level, the LTV ratio addresses systemic risk whether or not it is frequently adjusted. However, the adjustment of the LTV ratio makes it a more potent countercyclical policy instrument.
Caps on the DTI ratio	The DTI ratio represents prudential regulation aimed at ensuring banks' asset quality when used alone. When used in conjunction with the LTV ratio, however, the DTI ratio can help further dampen the cyclicality of collateralized lending by adding another constraint on households' capacity to borrow. Like in the LTV ratio, adjustments in the DTI ratio can be made in a countercyclical manner to address the time dimension of systemic risk.
Caps on foreign currency lending	Loans in foreign currency expose the unhedged borrower to foreign exchange risks which, in turn, subject the lender to credit risks. The risks can become systemic if the common exposure is large. Caps (or higher risk weights, deposit requirements, etc.) on foreign currency lending may be used to address this foreign-exchange-induced systemic risk.
Ceilings on credit / Credit growth	A ceiling may be imposed on either total bank lending or credit to a specific sector. The ceiling on aggregate credit or credit growth may be used to dampen the credit/asset price cycle—the time dimension of systemic risk. The ceiling on credit to a specific sector, such as real estate, may be used to contain a specific type of asset price inflation or limit common exposure to a specific risk—the cross-sectional dimension of systemic risk.
Reserve requirements	This monetary policy tool may be used to address systemic risk in two ways. First, the reserve requirement has a direct impact on credit growth, so it may be used to dampen the credit/asset price cycle—the time dimension of systemic risk; second, the required reserves provide a liquidity cushion that may be used to alleviate a systemic liquidity crunch when the situation warrants.
Countercyclical capital requirements	The requirement can take the form of a ratio or risk weights raised during an upturn as a restraint on credit expansion and reduced during a downturn to provide a cushion so that banks do not reduce assets to meet the capital requirement. A permanent capital buffer, which is built up during an upturn and deleted during a downturn, serves the same purpose. Both can address the cyclicality in risk weights under Basel II based on external ratings that are procyclical.
Time-varying/Dynamic provisioning	Traditional dynamic provisioning is calibrated on historical bank-specific losses, but it can also be used to dampen the cyclicality in the financial system. The provisioning requirement can be raised during an upturn to build a buffer and limit credit expansion and lowered during a downturn to support bank lending. It may be adjusted either according to a fixed formula or at the discretion of the policy maker to affect banks' lending behavior in a countercyclical manner.
Restrictions on profit distribution	These requirements are intended to ensure the capital adequacy of banks. Since undistributed profits are added to bank capital, the restrictions tend to have a countercyclical effect on bank lending if used in a downturn. The capital conservation buffer of Basel III has a similar role.
Limits on net open positions/Currency mismatches	These tools limit banks' common exposure to foreign currency risks. In addition, the limits may be used to address an externality—sharp exchange rate fluctuations caused by a convergence of purchases/sales of foreign exchange by banks. This externality increases the credit risk of unhedged borrowers with heavy foreign currency debt.
Limits on maturity mismatch	These may be used to address systemic risk as the choice of asset/liability maturity creates an externality—asset fire sales. In a crisis, the inability of a financial institution to meet its short-term obligations due to maturity mismatches may force it to liquidate assets, thus imposing a fire sale cost on the rest of the financial system. The funding shortages of a few institutions could also result in a systemic liquidity crisis due to the contagion effect.

DT = debt to income, LTV = loan to value.
Source: Lim, Cheng Hoon, Francesco Columba, Alejo Costa, Piyabha Kongsamut, Akira Otani, Mustafa Saiyid, Torsten Wezel, and Xiaoyong Wu. 2011. "Macroprudential Policy: What Instruments and How to Use Them?: Lessons from Country Experiences." IMF Working Paper No. 11/238.

APPENDIX 3: MACROPRUDENTIAL MEASURES IN THE REPUBLIC OF KOREA

Year:Quarter	Measures
2000:Q2	Foreign exchange banks were required to maintain short-term assets (less than 3 months) of at least 80% (previously 70%) of short-term liabilities and long-term borrowing (more than 3 years) in excess of 50% of long-term assets.
2001:Q1	The limits on deposits abroad that may be held by general corporations and individuals were eliminated, but general corporations and individuals must notify the BOK when amounts exceed $50,000 a day or its equivalent. Credits and loans to nonresidents of more than KRW1 billion a borrower denominated in domestic currency and granted by institutional investors require BOK approval (previously, KRW100 million and approval was granted by the Ministry of Finance and Economy.
2002:Q2	Starting from the end of June 2002, the authorities strengthened the loan loss provisioning requirements on household loans, including housing collateralized loans, by raising the provisioning ratio for normal loans from 0.5% to 0.75%, for precautionary loans from 2% to 8%, and for doubtful loans from 50% to 55%. Starting from the end of June 2002, the authorities classified housing collateralized loans, which were overdue for more than 3 months and an LTV ratio greater than 60% as "substandard," and thus charged a higher loan loss provisioning ratio.
2002:Q3	On 9 September 2002, the authorities introduced the maximum LTV ratio of 60% for loans extended by banks and insurance companies and with all maturities to buy houses in the speculation-prone zones. Before this measure was introduced, the typical maximum LTV ratio for loans extended to speculation-prone zones was 70%–80%. All the other areas were not subject to any LTV ratio regulation. At the end of September 2002, the authorities raised the loan loss provisioning ratio for the loan amount exceeding the 60% LTV ratio from 0.75% to 1% for normal loans and from 5% to 10% for precautionary loans.
2002:Q4	On 16 October 2002, the authorities expanded the application of the 60% maximum LTV ratio to loans of all maturities to buy houses in the speculative zones and the other areas.
2002:Q4	On 13 November 2002, the authorities raised the risk weight for housing collateralized loans from 50% to 60% if one of the following conditions hold or to 70% if both conditions hold: (i) the loan is more than 30 days overdue at the moment or the cumulative days of overdue during the past year is more than 30 days, (ii) the ratio of a borrower's housing collateralized loans to the borrower's annual income is greater than 250%.
2003:Q1	In January 2003, the authorities raised the loan loss provisioning ratio for precautionary loans extended by banks from 5% to 8%. The increase also applied to insurance and finance companies.
2003:Q2	On 23 May 2003, the authorities reduced from 60% to 50% the maximum LTV ratio applied to loans of 3 years or shorter maturity and extended by banks and insurance companies to buy houses in the speculative zones or speculation-prone zones, with some exceptions.
2003:Q4	On 29 October 2003, the authorities reduced from 50%–60% to 40% the maximum LTV ratio applied to loans extended by banks and insurance companies with 10 years or shorter maturity to buy apartments in the speculative zones, with some exceptions.
2005:Q3	On 4 July 2005, the authorities reduced the maximum LTV ratio from 60% to 40% for loans extended by banks and insurance companies with 10 years or shorter maturity to buy apartments worth KRW600 million or more located in the speculative zones.
2005:Q3	In September 2005, the authorities introduced the maximum DTI ratio of 40% for loans extended by all financial institutions to buy houses in the speculative zones, only if the borrower was single and under the age of 30 or if the borrower was married and the spouse had debt. This measure was announced on 31 August 2005.
2006:Q1	The overall net open position (short-hand position) of foreign exchange banks measured by the sum of the net short positions or the sum of the net long positions, whichever is greater, was limited to 30% (previously, 20%) of the total equity capital at the end of the previous month.
2006:Q2	On 5 April 2006, the authorities set the maximum DTI ratio of 40% for loans extended by all financial institutions to purchase luxury (KRW600 million or above) condominiums located in the speculative zones. This measure was announced on 30 March 2006.The overall net open position (short-hand position) of foreign exchange banks measured by the sum of the net short positions or the sum of the net long positions, whichever is greater, was limited to 50% (previously, 30%) of the total equity capital at the end of the previous month.

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Appendix 3 continued

Year:Quarter	Measures
2006:Q4	On 20 November 2006, the authorities set the maximum LTV ratio to 50% for loans extended by nonbank financial institutions (such as mutual credit companies, mutual savings banks and credit-specialized financial institutions) and with 10 years or shorter maturity to buy houses worth KRW600 million or more in the speculative zones. In November 2006, the authorities abolished the exceptions of the 60% maximum LTV ratio taken in 2003 for loans extended by banks and insurance companies with less than 1 year of interest-only payments, so that they were subject to 40% maximum LTV ratio. However, loans with maturity more than 10 years and extended for apartments worth more than KRW600 million remained subject to the maximum 60% LTV ratio. In November 2006, the authorities set the maximum DTI ratio to 40% for loans extended by all financial institutions to purchase luxury condominiums located in the speculation-prone zones.
2006:Q4	On 23 December 2006, to slow the rapid growth in private credit partly due to increased foreign currency borrowing by banks and to stabilize property prices, the central bank increased the reserve requirement ratio from 5% to 7% for demand deposits, money market deposit account and other nonsavings deposits, and reduced the reserve requirement ratio from 1% to 0% for long-term savings deposits, while maintaining the 2% reserve requirement ratio for time deposits, certificates of deposit and instalment deposits. Overall, the average reserve requirement ratio increased from around 3% to around 3.8%. On 23 December 2006, the central bank increased the reserve requirement ratio from 5% to 7% for demand deposits in foreign currency, while the reserve requirement ratios for the other types of deposits remained the same.
2007:Q1	In February 2007, the authorities set the maximum DTI ratio as 40%–70% for loans extended by banks to buy houses worth KRW600 million or less.
2007:Q3	In August 2007, the authorities set the maximum DTI ratio as 40%–70% for loans extended by nonbank financial institutions.
2009:Q3	In July 2009, the authorities lowered from 60% to 50% the maximum LTV ratio applied to loans extended by banks with maturities of over 10 years to buy apartment units worth KRW600 million or more and located in the metropolitan areas (Seoul nonspeculative zone, Incheon, and Kyunggi Province), loans extended by banks with maturities of 10 or less years to buy apartment units located in the metropolitan areas (Seoul nonspeculative zone, Incheon, and Kyunggi Province), and loans extended by banks with maturities of 3 or less years to buy nonapartment detached units located in the metropolitan areas (Seoul nonspeculative zone, Incheon, and Kyunggi Province).
2009:Q3	In September 2009, the authorities expanded the areas of application of the maximum DTI ratio to loans extended by banks to buy houses in areas including nonspeculative zones in Seoul and the metropolitan area. In particular, the three Gangnam districts became subject of the maximum DTI ratio of 40%, nonspeculative zones in Seoul subject to 50%, and the other metropolitan areas subject to 60%.
2009:Q4	In October 2009, the authorities expanded the maximum LTV ratio of 50% to nonbank financial institutions (that is applied to all financial institutions) for loans to buy houses located in the metropolitan areas.
2010:Q4	In October 2010, the leverage cap on foreign currency-denominated derivatives position of banks puts explicit ceilings on the notional value of forex derivatives contract at 250% of equity capital for foreign bank branches and 50% of equity capital for domestic banks.
2011:Q2	In April 2011, the authorities abolished the DTI ratio exemption introduced in August 2010, while allowing some exceptions, and reinstated the maximum DTI ratios for mortgage loans (40% for speculative areas, 50% for nonspeculative Seoul areas, and 60% for Incheon and Kyunggi areas).
2011:Q4	The authorities announced on 29 June 2011 that by the end of 2011 they plan to introduce higher risk weights on high-risk mortgage loans or excessive loans disproportionately concentrated on a certain sector (e.g., mortgage loans extended by a bank exceeding 2 times its equity capital).
2011:Q3	In July 2011, the leverage cap on foreign currency-denominated derivatives position of banks lowered to 200% of equity capital for foreign bank branches and 40% of equity capital for domestic banks.
2012:Q4	The BOK announced to reduce the ceiling on foreign exchange banks' foreign exchange derivatives position by 25%.
2013:Q1	The limits on banks' foreign exchange derivatives contracts were reduced from 40% to 30% of bank capital (for domestic banks) and from 200% to 150% (for foreign bank branches).

BOK = Bank of Korea, DTI = debt to income, KRW = Korean won, LTV = loan to value.
Source: Kuttner, Kenneth N., and Ilhyock Shim. 2013. "Can non-interest rate policies stabilise housing markets? Evidence from a panel of 57 economies." BIS Working Paper No. 433. http://www.bis.org/publ/work433.pdf

APPENDIX 4: MACROPRUDENTIAL MEASURES IN SINGAPORE

Date	Measures
September 2009	Removal of the interest absorption scheme and interest-only housing loans.
February 2010	The LTV ratio cap was lowered from 90% to 80% for housing loans granted by financial institutions. An SSD (including on executive condominium units and Housing and Urban Development Company apartments bought from the resale market) was introduced on all private properties sold within 1 year of purchase at the rate of 1% for the first S$180,000, 2% for the next S$180,000 and 3% for the remaining balance.
August 2010	The LTV ratio cap was lowered from 80% to 70% for housing loans granted by financial institutions to borrowers with one or more outstanding housing loans; the minimum cash down payment was increased from 5% to 10%. The SSD was extended to sales within 3 years of purchase, with the full SSD rate prorated depending on the length of the holding period.
January 2011	The LTV ratio cap was lowered to 60% for housing loans granted by financial institutions to individuals with one or more outstanding loans and to 50% for nonindividuals. The SSD was extended to sales within 4 years and rates raised to 16% for sales within a year, decreasing gradually thereafter to a minimum of 4% in the fourth year.
December 2011	An ABSD was imposed at a rate of 10% on foreigners and corporate entities buying any residential property, and 3% on permanent residents buying second or subsequent residential property and Singapore citizens buying their third and subsequent residential property.
October 2012	A limit of 35 years was introduced for all new housing loans granted by financial institutions; if the loan tenor exceeded 30 years, or the sum of the loan tenor and the age of the borrower exceeded 65 years, the LTV cap was reduced to 40% from 60% for borrowers with one or more outstanding housing loans, and to 60% from 80% for borrowers with no outstanding housing loans; the LTV ratio cap was reduced to 40% from 50% for new housing loans to entities such as corporations.
January 2013	For individuals obtaining a second mortgage from financial institutions, the LTV ratio cap was lowered from 60% to 50% (30% if the loan exceeded 30 years or would mature after the borrower's retirement age of 65); for individuals obtaining the third or subsequent mortgages, the LTV ratio cap was lowered to 40% (20% if the loan exceeded 30 years or would mature after the borrower's retirement age of 65); and for nonindividual borrowers, the LTV ratio cap was lowered to 20% from 40%; the minimum cash down payment was increased from 10% to 25% for borrowers with one or more outstanding housing loans. The MSR was capped at 30% of a borrower's gross monthly income for housing loans granted by financial institutions for the purchase of HDB apartments, and lowered from 40% to 35% for loans granted by HDB for the purchase of its apartments. The ABSD rates were raised from 10% to 15% on foreigners and corporate entities; from 3% to 10% on permanent residents purchasing the second or more residential properties and on Singapore citizens purchasing the third or more residential properties; a new ABSD of 5% was imposed on permanent residents purchasing their first residential property, and 7% on Singapore citizens purchasing the second residential property.
February 2013	LTV ratio ceilings were introduced for motor vehicle loans (excluding commercial vehicles and motorcycles). A maximum LTV ratio of 50% was set for cars with open market value of greater than S$20,000 and 60% for lesser valued cars. The maximum tenor of a motor vehicle loan was capped at 5 years. The 2013 budget contained tax measures targeting the nonowner-occupied residential properties (let-out residential properties were taxed at progressive rates between 10%–20% compared to the flat 10%) with the revised rates phased in over 2 years; the property tax refund was removed for vacant properties from January 2014; and the progressivity of the property tax system was increased for owner-occupied residential properties.

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Appendix 4 continued

Date	Measures
June 2013	The MAS introduced a TDSR framework for all property loans granted to individuals, limiting total debt service payments to 60% of a borrower's income. Under this framework, debt service on the housing loan is calculated based on the higher of the prevailing market interest rate or a medium-term interest rate of 3.5%, while debt service on nonresidential property loans is computed based on the higher of the actual market rate or a medium-term interest rate of 4.5%. As a refinement of previous measures, borrowers named on a property loan were required to be mortgagors of the residential property for which the loan was taken. Guarantors would need to be brought in as coborrowers if the borrower did not meet the TDSR threshold of 60%. In case of joint borrowers, the income-weighted average age of the borrowers would be used in applying rules on loan tenor. (In February 2014, the MAS refined the TDSR framework with broader exemptions. Borrowers refinancing owner-occupied housing loans borrowed before the TDSR's June 2013 introduction would be exempt from the 60% limits, and those refinancing public housing loans from limits on the MSR. Similarly, borrowers were allowed to maintain the remaining loan tenors when refinancing owner-occupied housing loans taken before the loan tenor limits were introduced.)
August 2013	The maximum tenor was reduced from 30 years to 25 years, and MSR lowered from 35% to 30%, for public housing loans granted by HDB; for housing loans granted by financial institutions for the purchase of public housing, the maximum tenor was reduced from 35 years to 30 years and loans with tenors exceeding 25 years and up to 30 years were subject to tighter LTV ratio limits.
September 2013	Announced measures to be progressively implemented between December 2013 and June 2015 include prohibiting financial institutions from granting further unsecured credit to individuals whose amount outstanding on any credit card or unsecured credit facility is 60 days or more past due or with total outstanding interest-bearing unsecured debt aggregated across all financial institutions exceeding their annual incomes for 3 consecutive months or more. Financial institutions were required to review a borrower's total debt and credit limits aggregated across all financial institutions before granting a new credit card, unsecured credit, or credit limit increases, to disclose to borrowers the potential cost of rolling over credit card debts and revolving credit and how the debt would accumulate, and to obtain a borrower's express consent for the amount of each credit limit increase.
December 2013	Introduction of MSR of 30% for housing loans granted by financial institutions for executive condominium units bought directly from property developers.

ABSD = Additional Buyer's Stamp Duty, HDB = Housing and Development Board, LTV = loan to value, MAS = Monetary Authority of Singapore, MSR = mortgage servicing ratio, SSD = seller stamp duty, TDSR = total debt serving ratio.
Source: Darbar, Salim M., and Xiaoyong Wu. 2015. "Experiences with Macroprudential Policy— Five Case Studies." IMF Working Paper No. 123.

APPENDIX 5: MACROPRUDENTIAL MEASURES IN INDONESIA

Year/Quarter	Measures
2001:Q1	BI limited forward foreign currency contracts offered by domestic banks to nonresidents was lowered to $3 million from $5 million for each customer at each bank.
2004:Q2	Deposit accounts in rupiah were made subject by BI to a reserve requirement in the range of 5% to 8%, depending on the total amount of deposits (previously, 5% of total deposits).
2004:Q3	The BI regulates the magnitude of NOP allowed to be held by banks according to the foreign currency risk-based management, both seen from the composition of the foreign currency in the balance sheet and administrative account, as well as from NOP time period at the end and at the middle of business day.
2004:Q4	Banks and nonbank financial institutions (including state-owned enterprises, private enterprises, and cooperatives) were required to report all offshore commercial borrowing, while individuals were required to report commercial offshore borrowing of the equivalent of $200,000 or higher.
2005:Q1	Short-term borrowings by banks were limited to 30% of bank capital. Long-term borrowings (maturities of more than 1 year) by banks required approval by BI.
2005:Q3	Bank Indonesia puts limit on rupiah transactions and foreign exchange lending by banks.
	The limit on forward and swap transactions of banks with nonresidents without an underlying investment-related transaction was reduced to $1 million from $3 million.
2009:Q4	The 2.5% secondary reserve requirement became operational after a 1-year transitional period, raising the total reserve requirement from 5% to 7.5%. The 2.5% secondary reserves may be met in the form of BI certificates, government bonds, and/or a current account deposit at the BI.
2010:Q3	BI imposed a 1-month minimum holding period for all investors (both domestic and foreign) for purchases of Bank Indonesia certificates (SBIs) in both the primary and secondary markets.
2010:Q4	BI raised the statutory reserve ratio in rupiah from 5% to 8%.
2011:Q1	BI raised statutory reserve requirement on foreign currency from 1% to 5%. BI (Regulation No. 13/4/PBI/2011) revoked the facility that provided foreign exchange liquidity to domestic companies by conducting spot transactions through commercial banks in connection with economic activities in Indonesia. A high loan-to-deposit ratio but insufficient capital adequacy ratio penalized with higher reserve requirement ratio.
2011:Q2	The minimum holding period for all investors (both domestic and foreign) for purchases of SBIs in both the primary and secondary markets was lengthened from 1 month to 6 months.
	BI raised statutory reserve requirement on foreign currency from 5% to 8%.
2011:Q3	BI Regulation No. 13/21/PBI/2011 on monitoring of bank activity in foreign exchange flows require banks to submit complete, accurate, and timely data on foreign exchange flows to the BI.
2012:Q2	BI introduced the maximum LTV ratio of 70% to bank loans backed by houses over 70 square meters and implementation to the *sharia*-compliant finance industry and ban the use of unsecured personal loan for credit advances. To deepen the foreign exchange market, BI relaxed the relevant provisions tenor forward to nonresident of the previous minimum of 3 months to a minimum of 1 week.
2013:Q3	Bank Indonesia amended its regulation concerning the LTV/FTV ratio for property credit and property-backed consumer loans. The LTV/FTV ratio is the ratio between the value of credit/financing that can be allocated by a bank and the corresponding value of collateral in the form of property when the loan is allocated. Property is real property that includes houses, vertical housing (apartments, flats, condominiums, and penthouses), home offices, and home stores.

BI = Bank Indonesia, FTV = financing to value, LTV = loan to value, NOP = net open position, SBI = Sertificat Bank Indonesia.
Source: Kuttner, Kenneth N., and Ilhyock Shim. 2013. "Can non-interest rate policies stabilise housing markets? Evidence from a panel of 57 economies." BIS Working Paper No. 433. http://www.bis.org/publ/work433.pdf

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Macroprudential Policy Frameworks in Developing Asian Economies

This paper presents a general macroprudential policy framework that highlights important aspects for conducting policy. It also provides an overview of how some Asian economies, New Zealand, and the euro area implement their macroprudential policies. It reviews existing macroprudential policy frameworks of five high-growth developing economies—Cambodia, Mongolia, Myanmar, Sri Lanka, and Viet Nam—identifying improvements and continuing challenges for their financial systems, which will likely grow more complex. Identifying and addressing key issues will help improve their existing macroprudential policy frameworks.

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